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He continues in the preface to his essay of 1887: "It is only through the purely logical process of building up the science of numbers and by thus acquiring the continuous number-domain that we are prepared accurately to investigate our notions of space and time by bringing them into relation with this number-domain created in our mind. If we scrutinise closely what is done in counting an aggregate or number of things, we are led to consider the ability of the mind to relate things to things, to let a thing correspond to a thing, or to represent a thing by a thing, an ability without which no thinking is possible. Upon this unique and therefore absolutely indispensable foundation, . . . must, in my judgment, the whole science of numbers be established."

Such is the fundamental idea of Dedekind's thought. He succeeded by means of it in building up a continuous number-system which included not only rational numbers but also, and *necessarily*, irrational numbers. These memoirs can, as their own author remarks, "be understood by any one possessing what is usually called good common sense; no technical philosophic, or mathematical, knowledge is in the least degree required."

ELEMENTE DER STEREOMETRIE. Von Prof. Dr. Gustav Holzmüller in Hagen i. W.

Vierter Teil, Fortsetzung der schwierigeren Untersuchungen. Mit 89 Figuren. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, xi, 311. Price, bound, 9.50 Marks.

HÖHERE ANALYSIS. Zweiter Teil. Integralrechnung. Mit 89 Figuren. Von Dr.

Friedrich Junker, Professor am Realgymnasium und an der Realanstalt in Ulm. Zweite, verbesserte Auflage. Leipzig: G. J. Göschen'sche Verlagshandlung. 1901. Pages, 209. Price, 80 Pf.

PROJEKTIVE GEOMETRIE. In synthetischer Behandlung. Von Dr. Karl Doeblmann, Privatdozent an der Universität München. Zweite, vermehrte und verbesserte Auflage. Mit 85 Figuren. Leipzig: G. J. Göschen'sche Verlagshandlung. 1901. Pages, 176. Price, 80 Pf.

DARSTELLENDE GEOMETRIE. Erster Teil. Elemente; Ebenflächige Gebilde. Von Dr. Robert Haussner, Professor an der Universität Giessen. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 192. Price, 80 Pf.

REPETITORIUM UND AUFGABENSAMMLUNG ZUR INTEGRALRECHNUNG. Von Dr. Fr. Junker, Professor am Realgymnasium und an der Realanstalt in Ulm. Mit 50 Figuren im Text. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 130. Price, 80 Pf.

REPETITORIUM UND AUFGABENSAMMLUNG ZUR DIFFERENTIALRECHNUNG. Von Dr. Fr. Junker, Professor am Realgymnasium und an der Realanstalt in Ulm. Mit 42 Figuren im Text. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 119. Price, 80 Pf.

The domain of pure elementary geometry was immensely extended by the researches of Poncelet, Chasles, Steiner, and Möbius, and the reaction which set in

during the nineteenth century against the purely analytical methods of the eighteenth has assumed so formidable proportions that the author of the first work above listed, Dr. Holzmüller, even intimates the *possibility* that analysis may at some future time be overtaken by geometry. He has himself been surprised at the simplicity of the methods and of the form of the results which he has reached in his purely geometrical developments without the assistance of the higher analysis, and many of his colleagues have joyfully recorded a like astonishment. It has not been the author's intention to render the calculus superfluous in the treatment of solid geometry, but merely to *systematise* the elementary methods, and to exhibit and apply them in the full extent of their new-born power, hoping in this way to obtain as many as possible new points of view for the subjects treated and to strengthen the student's powers of spatial visualisation. The present and last volume of this extensive and scholarly work on solid geometry presents the elements of the theory of certain moments of homogeneous point-systems, particularly static and centrifugal moments and moments of inertia; applies in their full generality the summation formulæ; gives stereometric and mechanical interpretations and visualisations of the above-mentioned moments for plane surfaces and curves; discusses the catenoid, Gauss's pseudo-spherical sphere; etc., etc.; the many subjects treated being too numerous to mention in detail. Elucidative historical and methodological remarks are interwoven in the text, all combining to make Holzmüller's work the most thorough and helpful existing treatise on the elements of solid geometry as developed without the use of the calculus. The publishers have done their utmost to render the work serviceable. Good indexes have been added.

The remaining five works listed at the head of this notice belong to the very cheap and admirable series of little mathematical text-books called the "Sammlung Göschen." The little treatise on the integral calculus by Dr. Junker is, as we have had occasion to learn in detail, a concise and adequate presentation of the subject. It consists of ten chapters treating respectively of the integration of simple, rational, irrational, and transcendental differentials, of definite integrals, of the application of the integral calculus to geometry of two and three dimensions and to statics, and of the double integral and its applications, giving finally a brief discussion of ordinary differential equations. Dr. Junker has also compiled (see the fifth work above listed) a syllabus of the formulæ of the integral calculus and a collection of examples for practicing it. He has done the same for the differential calculus (see the sixth work above listed), which is issued as a species of supplement of his work on the differential calculus in this same series. These little books can be used independently of their companion works, inasmuch as in each case the formulæ precede the exercises, and illustrative examples are worked out at the beginnings of each section. They are also supplied with figures. Little knowledge of German is requisite to use these books profitably.

Dr. Doeblemann's book on *Projective Geometry* is intended for beginners who are just about entering on the study of modern synthetic geometry. The subject

has been attacked from different sides, not excluding that of metrical geometry, although of course the chief emphasis has been placed on constructive and visualising methods. The geometry of space is considered in connection with that of the plane. The figures are in two colors.

Dr. Robert Haussner, the author of the *Descriptive Geometry* in this series, is professor in the University of Giessen and the translator of Monge's celebrated *Géométrie descriptive*, which was the pioneer work of this very practical and useful branch of mathematics, and the inaugurator of the modern Renaissance of geometrical research. Dr. Haussner's work, while concise, is very comprehensive and a thoroughly modern presentation of its subject.

It will not be amiss to mention in this connexion that Göschen has also recently issued the first part of a *Multidimensional Geometry* by Dr. P. H. Schoute, of the University of Groningen, Holland. The book treats of linear spaces and the work will restrict its investigations to the geometry of Euclid. μ .

THE SCIENCE OF MECHANICS. A Critical and Historical Account of Its Development. By *Dr. Ernst Mach*, Professor of the History and Theory of Inductive Science in the University of Vienna. Translated from the German by Thomas J. McCormack. Second Revised and Enlarged Edition. With 259 Cuts and Illustrations. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co. 1902. Pages, xix, 605. Price, Cloth, \$2.00 net (9s. 6d. net).

The appearance of the second edition of Dr. Ernst Mach's now famous work on the development of mechanics is coincident with a wide-spread revival of philosophical interest in the foundations and methods of the various exact sciences ; and the translator of the present work remarks :

" Since the appearance of the first edition of the present translation of Mach's *Mechanics*, the views which Professor Mach has advanced on the philosophy of science have found wide and steadily increasing acceptance. Many fruitful and elucidative controversies have sprung from his discussions of the historical, logical, and psychological foundations of physical science, and in consideration of the great ideal success which his works have latterly met with in Continental Europe, the time seems ripe for a still wider dissemination of his views in English-speaking countries. The study of the history and theory of science is finding fuller and fuller recognition in our universities, and it is to be hoped that the present exemplary treatment of the simplest and most typical branch of physics will stimulate further progress in this direction."

The text of the present edition of the English translation contains the extensive additions made by the author to the fourth German edition published in 1901, and has been thoroughly revised throughout. The author's additions are considerable, occupying a space of more than seventy pages, the principal sections being those discussing Hertz's *Mechanics* and the concepts of mass, inertia, absolute